



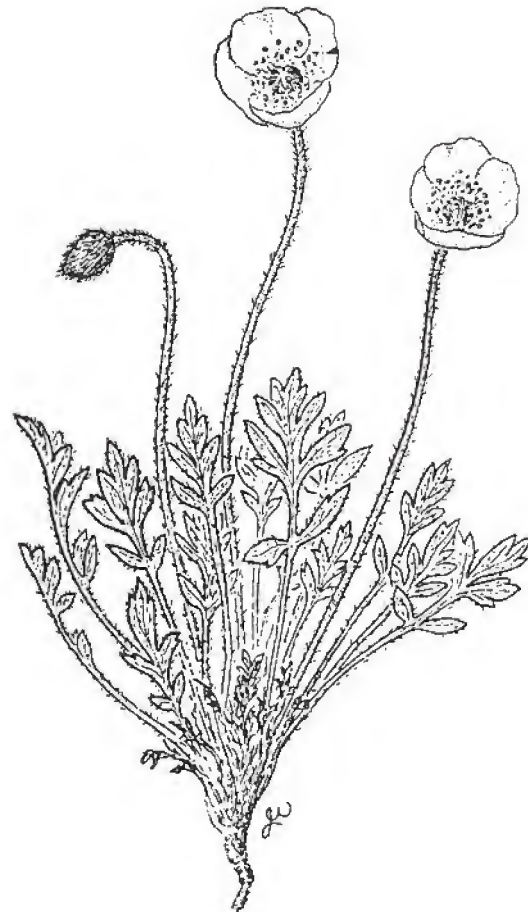
Castilleja

The Newsletter
of the Wyoming
Native Plant Society

December 1998
Volume 17, No. 4

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Alpine Poppy (*Papaver kluanense*) is a 2-6 inch tall perennial herb with greenish-yellow 4-petaled flowers and pinnately-lobed, hairy basal leaves. This species occurs across arctic Canada and Alaska, with scattered, disjunct populations in the high peaks of the Rocky Mountains as far south as New Mexico. In Wyoming, it is a rare inhabitant of alpine meadows and scree slopes in the Absaroka, Bighorn, and Wind River ranges. Alpine poppy is one of only five species in the poppy family (Papaveraceae) in the state. Illustration by Janet Wingate from the "Colorado Rare Plant Field Guide".

WNPS NEWS

1999 Wyoming Rare Plant Conference: In conjunction with several federal agencies and the Wyoming Rare Plant Technical Committee, WNPS is helping to sponsor the fifth state rare plant conference March 16-18, 1999 at the BLM Rawlins District Office in Rawlins, WY. The conference will address a number of rare plant issues, including habitat needs, monitoring problems, results of various research projects, and a review of the status of selected species of concern. For more information on the conference, contact Walt Fertig (307-745-5026 or email clayde@uwyo.edu) or Charmaine Delmatier (delmatierc@juno.com).

1999 Student Scholarship Reminder: The deadline for the 1999 WNPS student scholarship is fast approaching. This scholarship is available to qualified junior college or university undergraduates or graduate students studying the native flora and fungi of Wyoming. One to three scholarships will be awarded this spring in the amounts of \$300-500. Interested students should contact the Secretary of the Society for an application form. Applications are due by 26 February 1999. The award(s) will be presented in March 1999.

1999 Annual Meeting and Field Trips: The Society's annual meeting and field trip to the desert basins of Southwest Wyoming has been scheduled for the weekend of June 19-20, 1999. The final itinerary has not yet been determined (and will be somewhat weather-dependant, as many potential sites are not accessible during rainy weather), but will probably include visits to the Flaming Gorge country south of the city of Green River, the McKinnon area, and the Devil's Playground badlands. A shorter, Sunday trip to Fossil Butte National Monument is also tentatively planned. Look for more complete details in the next issue of *Castilleja*.

A weekend of botanizing in the Beartooths is planned for Saturday, 31 July and Sunday, 1 August 1999. This trip will focus on the interesting botanical features of the Beartooth Range, including stops to the Lily Lake bogs, Clay Butte, and the Twin Lakes/Line Creek area on the Beartooth Plateau. A side trip to the Swamp Lake wetland in the Clarks Fork Valley is certainly a possibility as well. Stay tuned for more details in *Castilleja* this spring.

New Members: Please welcome the following new members of WNPS: Mary Katherman (Douglas), Meadow Acres Greenhouse (Evansville), and Amy Parker (Laramie).

Attention Readers: We are always looking for articles and illustrations for the newsletter. Items for the March issue are needed by 25 February 1999.

Treasurer's Report: Balance as of 28 December 1998: General Fund \$348.84; 1998-99 Student Scholarship Fund \$1075.00; Total funds: 1423.84 WF

Wyoming Native Plant Society
1604 Grand Ave., Laramie, WY 82070

President: Charmaine Refsdal Delmatier (Green River)
Vice President: Jim Ozenberger (Jackson)
Secretary-Treasurer: Walt Fertig (Laramie)
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Newsletter Editor: Walt Fertig (307) 745-5026 (wk)/e-mail: clayde@uwyo.edu.

Teton Chapter: PO Box 82, Wilson, WY 83014 (Joan Lucas, Treasurer). For general information on events, call Katy Duffy (543-2959).

Contributors to this issue: Jane Dorn, Walter Fertig (WF), Jeanne Janish, Stuart Markow, Laura Welp, Janet Wingate.

More Web Sites: The Center for Plant Conservation (CPC) is the only national organization dedicated solely to protecting native plants of the United States from extinction. The center, based out of the Missouri Botanical Garden, is a consortium of 29 botanical gardens and arboreta that promote off-site conservation of rare plants, seed banks, scientific research, restoration, and education. To learn more about the CPC, consult their website: www.mobot.org/CPC.

The IUCN Red list of Threatened Plants (mentioned in the October 1998 issue of *Castilleja*) is now available over the internet at www.wcmc.org.uk. Species on the list can be queried by name, degree of threat, or distribution. WF

Below: *Echinacea angustifolia* (USFS).



Additions to the Flora of Wyoming

By Walter Fertig

Since the last installment of this feature (*Castilleja*, March 1998), five new species have been discovered in the state of Wyoming, two of which are native and of high conservation interest.

Astragalus platytropis (Broad-keeled milkvetch): Ron Hartman, curator of the University of Wyoming's Rocky Mountain Herbarium, discovered this silvery-leaved, low-growing member of the pea family (Fabaceae) in 1996 while botanizing on BLM lands on Rattlesnake Mountain (just north of Buffalo Bill Reservoir in Park County). This species superficially resembles *Astragalus jejunus*, but can be recognized by its broadly truncate keel and inflated fruit pods consisting of 2 separated chambers. This species occurs from southeast Oregon and eastern California to western Utah and from east-central Idaho to southwest Montana in barren ridgecrest and talus slope habitats.

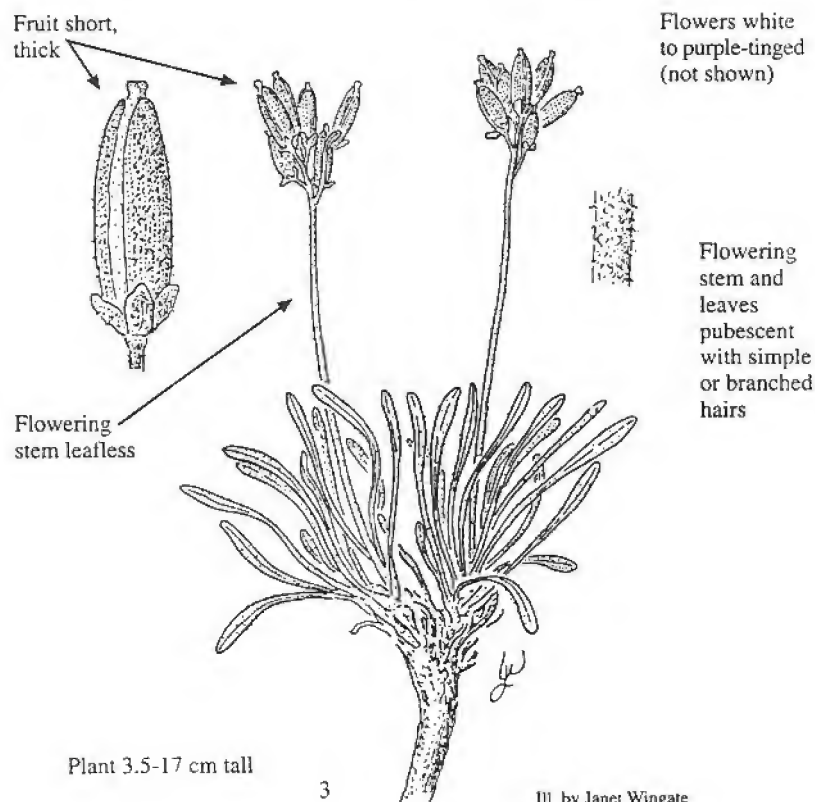
Braya glabella (Arctic braya): I discovered this diminutive mustard while hunting for rare plants on Doubletop Mountain in the Gros Ventre Range in 1998. Arctic braya can be recognized by its low stature, basal rosette of grayish-hairy leaves, and condensed infructescence of short hairy siliques with an unusually broad replum and stout style. This species is widely dispersed across the arctic from Alaska to Quebec, extending south to British Columbia. Disjunct populations occur in central Colorado, and now in northwestern Sublette County, Wyoming. *Braya glabella* is the second member of this genus to be discovered in the state (see *Castilleja*, December 1996).

Eragrostis pilosa (India lovegrass): This introduced annual grass was discovered in Platte County, Wyoming by Robert Dorn in 1998. India lovegrass lacks glands or has just a few dish-shaped glands on the rachis or stem internodes, and does not form mats. This is the second new *Eragrostis* to be discovered in the state in recent years. Ernie Nelson of the Rocky Mountain Herbarium discovered *E. spectabilis* (purple lovegrass) along a roadside in Goshen County in 1994. *E. spectabilis* is a native perennial bunchgrass that resembles *E. trichodes*, but has shorter anthers.

Papaver somniferum (Opium poppy): My dog Max and I discovered this exotic species in a greasewood playa near Interstate 80 in Laramie this past summer. Although notorious as the source of heroin and opium gum, opium poppy is also the source of poppy seeds, the medicinal drugs morphine and codeine, and is an attractive ornamental. The Laramie plants appear to be escaped garden plants, as evidenced by their "double" corolla. *P. somniferum* was originally native to the Mediterranean, but is now widely cultivated (legally and illegally) in Europe, Asia, and North America.

Spergularia echinosperma: This native of Eurasia was discovered in Platte County by Robert Dorn in 1998. An annual, *S. echinosperma* differs from related species in its genus in having blackish, wingless seeds, narrower leaves, and shorter stipules. This is the second new *Spergularia* to be discovered in Wyoming since 1994 (*Castilleja*, December 1994). This taxon is sometimes referred to as *S. diandra*.

Below: *Braya glabella*. Illustration by Janet Wingate from "Colorado Rare Plant Field Guide".



Are We Digging *Echinacea* Too Much?

"...just grab a shovel, start digging, and make some money!!!" - ad in the Williston Shopper [North Dakota]

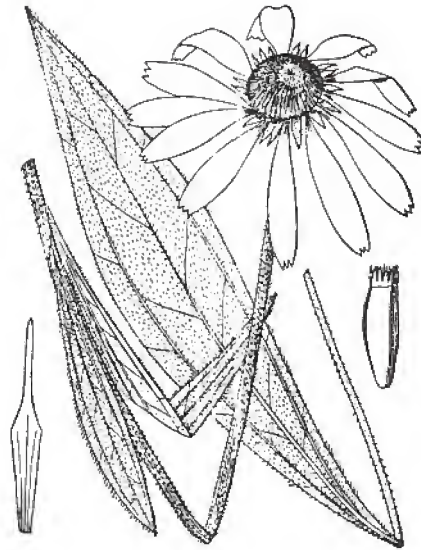
By Laura Welp

We all know the signs of impending doom: that tickle at the back of the throat, the fatigue, the runny nose. "Take some *Echinacea*", our friends tell us. More and more of us these days are doing just that, because it seems to make our colds go away sooner or at least lessen the symptoms. For years *Echinacea* and other herbal medications could only be found in health food stores, but the herb is so popular now that it can be found on the shelves of national supermarket chains, a sure sign of its snug incorporation into mainstream American culture. Its sales are approaching that of aspirin, according to one herbal magazine. But where is all this *Echinacea* coming from?

Scientists and land managers in Montana, the Dakotas, Oklahoma, Kansas, and Wyoming can tell you as they point to the holes in the ground where *Echinacea* meadows used to be. Although some commercially grown *Echinacea* is available, most products in the U.S. come from wild stock that is collected in the West and processed into the medicine we buy in the store. Plants are now so valuable that some harvesters take every individual in a population. The medicinal, and valuable, part of the plant is its long, deep taproot. Collectors look for the largest, oldest plants since they have the biggest roots and are worth the most. Once those are gone, however, the younger plants are taken until the whole field is decimated. Harvesting usually occurs in spring or fall, when the root is more medicinally potent, but since money is offered year round and competition is increasing, some people are extending the digging season and harvesting even more plants.

Echinacea, or purple cone-flower, is in the sunflower family. There are nine species of the *Echinacea* genus in the United States, two of which are federally listed as Endangered in the south. *Echinacea angustifolia* is the common species in the western and northern plains, and it is the only species in Wyoming. For centuries it was used by Plains Indians, who shared the plant with European settlers. They took it back to Europe and it became widely used. It continues to be popular, especially in Germany, where as much as 50,000-100,000 pounds of wild material is imported from the US annually to meet the demand. The plant apparently has a cortisone-like component, as well as insecticidal and bactericidal activity, and it is considered a nonspecific immune system stimulant that may promote the production of white blood cells. (However, in the interest of fairness - a study published in the November 1998 *Archives of Family Medicine* found that it was no better at preventing colds than a placebo.)

Now that the root of the herb brings up to \$21 per pound, more people are finding it worth digging, especially those in rural areas where unemployment is high. Advertisements like the one at the top of this article are appearing more frequently. Buyers have been seen in trucks parked at intervals along highways in western Montana collecting roots from diggers.



Above: *Echinacea angustifolia* from Britton and Brown (1913)

One rural bar owner gives cash for roots. At first, people confined their harvest to easily accessible areas such as pastures and roadsides, but as those populations shrink harvesters are trespassing on private land, poaching from nature reserves, and collecting on public land without permits. For example, the Black Hills and Bighorn National Forests in Wyoming and the Custer National Forest in Montana have been targets of *Echinacea* poachers. Although any commercial harvesting on public land without a permit is illegal, the lack of law enforcement has made public lands a favorite of harvesters. Federal land managers don't have a good permitting process or monitoring program, or the money to administer them. Currently, the Forest Service has stopped issuing permits on some forests until the extent of the problem can be assessed and sustainable harvest limits determined. Land managers and conservationists feel that current harvest levels of wild *Echinacea* can't be sustained. In addition to reducing populations of the plant, the mechanical disturbance caused by harvesting may create other problems. Invasion by exotic plants is one possibility. Removing *Echinacea* also alters already-rare prairie vegetation, and may impact butterflies and birds by reducing a food source.

Echinacea is falling prey to the fallacy, common in the West, that an abundant resource can never be depleted. Ubiquitous though it seems, *Echinacea* could be significantly diminished in a matter of years if it continues to be extensively collected. It has largely disappeared from Kansas and

Nebraska, although stocks in Missouri (the only state with laws against harvesting it on state lands) are currently doing well. Stocks in Montana appear to be declining, according to anecdotal reports. Much of the problem results from harvesters and some land managers not realizing the extent of the damage, so education is called for.

Cultivation of *Echinacea* is the best answer to the problem, however. Commercially grown, organic *Echinacea* could be an important economic crop. Almost all *Echinacea* species are easy to cultivate, and the US Fish and Wildlife Service, Clemson University and others are trying to promote it as an alternative cash crop. The interest is there, but at this point there are not enough sources of cultivated plants to meet the need. For example, many professional wildcrafters who produce *Echinacea* preparations are concerned about the overcollection problem. They would like to use organic, cultivated material but since the demand for it far exceeds the supply, they must obtain some of their roots by wildcrafting. Not all herbalists harvest unethically, however. Many are careful to harvest only part of any population they find, and they collect only in the fall after seed has set so that there will be more plants next year. Many herbalists are trying to line up sources of cultivated plants to further reduce or eliminate their dependence on wild stock.

In the meantime, purchase your *Echinacea* responsibly. Know your supplier. Try to patronize sources that sell commercially grown organic products, or that harvest responsibly. If the label doesn't say its material was cultivated, it probably came from the wild. If there are no stores that carry cultivated *Echinacea* in your area, request it, and consider using *Echinacea* sparingly until commercial crops catch up. Realize that medicine bought from sources you don't know may not have been treated properly. The root must be dried slowly to maintain its effectiveness, but some suppliers bake their material quickly to save time, perhaps reducing its medicinal efficacy. How about growing your own plants, and becoming a supplier yourself? Overharvesting *Echinacea* can be a temporary problem if suppliers provide and users demand products from cultivated plants.

Botany Briefs

Desert Yellowhead Proposed as Threatened: On December 22, 1998, the US Fish and Wildlife Service proposed listing the Desert yellowhead (*Yermo xanthocephalus*) as Threatened under the Endangered Species Act (see *Castilleja*, October 1998). Desert yellowhead is the only known species in its genus, and is restricted to the Beaver Rim area of Fremont County, Wyoming. The habitat of this species is on BLM lands currently managed for multiple use (including potential oil and gas development). The population currently contains about 11,600 individuals, restricted to 6 acres of suitable area. The species is considered vulnerable to extinction due to its small range, specialized habitat, and threats from potential mineral exploration and recreational activities. The BLM is currently developing a strategy to manage the plant's habitat

(the reason it was proposed for listing as Threatened, rather than Endangered).

The US Fish and Wildlife Service is soliciting public comments on this proposed listing through 5 February 1999. Comments should be sent to the Field Supervisor, Wyoming Field Office, US Fish and Wildlife Service, 4000 Airport Parkway, Cheyenne, WY 82001. WF

New Plants in North America: While nearly everyone acknowledges the vast number of undescribed species of plants in the tropics, the flora of temperate zone areas, like North America, is often thought to be pretty well known. A new publication by University of Wyoming botanists Ron Hartman and Ernie Nelson challenges this assumption with impressive numbers. In a recent twenty year period (1975-1994), Hartman and Nelson report that 1,197 new taxa of vascular plants were described from North America north of Mexico, an average of about 60 new species and varieties each year. The majority of these plants are restricted to remote and unusual microhabitats in the western and southeastern portions of the United States. The rate of new discovery has been nearly constant for the last four decades and shows no signs of letting up.

Hartman and Nelson's work "Taxonomic Novelties from North America North of Mexico: a 20 Year Vascular Plant Diversity Baseline" was published in 1998 by the Missouri Botanical Garden in its series "Monographs in Systematic Botany" (# 67). The publication was prominently featured in the November 16, 1998 issue of *US News and World Report*. WF

Line Creek Plateau RNA Proposed: The Line Creek Plateau covers approximately 20,000 acres of alpine grasslands and conifer forests in the Beartooth Mountains of Montana and Wyoming. The area contains approximately 20 main vegetation types, outstanding examples of permafrost features (including frost hummocks, frost boils, stone nets, stone stripes, and solifluction terraces), and habitat for over 30 rare plant and animal species. Among the interesting plants found in the area are several arctic-alpine disjuncts (*Draba glabella*, *Eriophorum callitrix*, *Kobresia schoenoides*, *Koenigia islandica*, *Pedicularis oederi*, *Phippsia algida*, *Salix barrattiana*, and *Senecio fuscatus*) and local endemics (*Pyrrocoma carthamoides* var. *subsquarrosa*, *Agoseris lackschewitzii*, and *Erigeron flabellifolius*). Several of these species only occur in the Line Creek area in the lower 48 states.

In November 1998, the Custer and Shoshone National Forests jointly proposed this area for designation as a Research Natural Area. RNAs are areas that are managed in an undisturbed condition in order to serve as "reference areas" for long-term ecological and biological studies. Due to the existing high recreational use of portions of the Line Creek RNA (the Beartooth Highway forms the southern boundary and the area is used for skiing, snowmobiling, and hiking), the RNA will have less stringent protection than many other areas in the RNA system. A final ruling on the Line Creek RNA is expected early in 1999. WF

Carnivorous Plants: Terror of Wyoming's Wetlands

By Stuart Markow

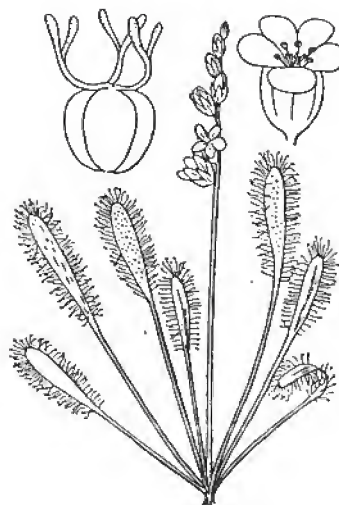
The idea of plants killing and eating animals has intrigued man for centuries. This fascination with carnivorous plants may result from: 1) the thought that there just might be plants that actually do eat people as portrayed in such movie classics as *Little Shop of Horrors* and *The Lost World*, and 2) an apparent situation of serious role reversal; people are used to thinking of animals eating plants, rather than vice-versa. In fact, while the ability of certain plants to capture insects and other small invertebrates has been accepted for a long time, the thought that these plants might digest and absorb critters was roundly rejected by biologists for many years. The concept was energetically denounced with the same scientific reasoning that historically has been used to deny reality on a number of fronts: it just didn't *seem* right!

Thus, those who did suggest that plants might be snacking on insects were ridiculed or ignored. It wasn't until the late 1800s that, with a series of elegant experiments using sundews and Venus flytraps, Charles Darwin provided such conclusive evidence for insectivory that the skeptics received little further attention. Subsequent investigation by Darwin and others served to elucidate the various mechanisms of carnivory in plants.

Today it is well documented that plants can and do prey on not only insects, but a wide variety of invertebrates and even vertebrate species as diverse as frogs, fish, tadpoles, birds and mice. The number of plants able to perform this feat is not well established, with reported figures ranging from 400 to 600 species. Part of this discrepancy is due to the taxonomic concepts subscribed to by various authors, but perhaps more importantly, there is not complete agreement as to what constitutes a carnivorous plant. In almost all cases, the anatomical equipment and processes used are simply modifications of structures and processes found throughout the plant kingdom. None of the individual features - traps, lures, directional guides, secretory glands, absorbing glands - are unique to carnivorous plants.

Wyoming is home to exactly 4 such species. The English sundew (*Drosera anglica*) occurs in a few soggy areas in the northwest portion of the state. Three species of bladderworts are found in varying frequencies. Common bladderwort (*Utricularia macrorhiza*), as the name implies, is common throughout. The lesser bladderwort (*U. minor*) is only rarely seen, and the flatleaf bladderwort (*U. intermedia*) is known in Wyoming only from the National Elk Refuge in Jackson Hole. None appear to be man eaters.

The genus *Drosera* is a large, diverse group with over 100 species distributed world wide, and ranging from less than half an inch to over 3 feet tall. The upper surface of each leaf blade is covered with glandular hairs (known as tentacles), each crowned by a drop of clear, sticky mucilage which glistens like dew in the sun, hence the common name "sundew". The name "English sundew" for Wyoming's sole representative of the genus, is something of a misnomer as this



Above: *Drosera anglica* (from Britton and Brown 1913).

plant is actually rather rare in England. In North America it occurs coast to coast at the higher latitudes, from Alaska to Newfoundland, extending south into New England, the Great Lakes area, and the Pacific Northwest. It just barely makes it into Wyoming, entering through Yellowstone and Grand Teton National Parks and the Beartooth Mountains.

The leaves of English sundew are generally in a basal rosette and three-to-five inches long. A single flower stalk arises from the center, bearing two-to-seven small white flowers. Leaf blades are densely covered with sticky tentacles, and the bright red glands contrast vividly with the pale green leaf surface.

When an insect alights on a leaf and touches a gland, it quickly becomes mired in the thick mucilage. As it attempts to escape, the commotion stimulates the glands it is in contact with to produce electrical impulses which travel to adjacent tentacles. The impulses induce the tentacles to secrete digestive fluids and, simultaneously, the tentacles begin bending toward the prey. These tentacles force the hapless victim into the fluids on the surface of the leaf where it quickly drowns, a casualty of its own efforts to escape. The same glands which secreted the digestive fluids then slurp up the resulting soup.

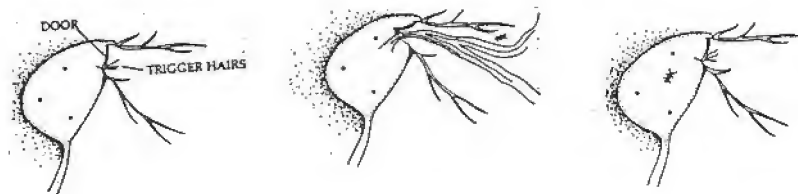
There is good evidence that *D. anglica* evolved from two of its contemporaries, the round-leaved sundew (*D. rotundifolia*), a wide-ranging species, and the slender-leaved sundew (*D. linearis*) which is restricted to the Great Lakes area and a narrow band along the Gulf of St. Lawrence. The distribution of these species poses a question which has not been convincingly resolved: how is it that *D. anglica* occurs in western North America, Europe and Japan where *D. linearis* has never been recorded?

The bladderworts (*Utricularia*) feature the most sophisticated trapping devices to be found among the carnivorous plants. These consist of tiny, very numerous bladders with one-way entrances adapted to catching miniscule swimming creatures in standing water or wet soil. The bladder-like trap is provided with a baited trap door complete with a tripping device. Once a small animal brushes against the door, the trap is sprung and the door flies open releasing a partial vacuum which sucks the victim inside. The door then shuts, imprisoning the prey within.

This is a large genus of nearly 300 species distributed world-wide. Most are aquatic, some are moist-terrestrial, a few are even epiphytic. All three of Wyoming's species are strictly aquatic, lurking in shallow wetlands and lunching on insects, water fleas, rotifers, copepods, and other minute critters.

The traps are scattered about the plant in great numbers, sometimes on the stems, sometimes on the leaves, sometimes on both. They are generally oval-shaped, with antennae-like appendages that appear to funnel prey to the trap entrance. A hinged door in front of the bladder is attached to the top of the opening and swings inward. At the base are pointed bristles which act as trigger hairs. The trap is set by removal of most of the water through glands located both inside and outside of the bladder. This removal generates a partial vacuum and, as a result, the door is held in place by a very finely balanced tension involving hydrostatic pressure countered by the door's weak grip on the edges of the bladder walls. The slightest touch of the trigger hairs is enough to break this tension.

The exact mechanism by which the touch stimulus opens the door has not yet been determined. Some researchers claim that the trigger hairs act as a lever, lifting the door's lower edge and breaking the tenuous connection between the door and the bladder walls. Others argue that the mechanical stimulus is transduced to an electrical signal which reduces the rigidity of the door, causing it to buckle under the inwardly directed hydrostatic pressure. In either case, when the door loses its precarious grip, it swings open and the prey is swept into the bladder with the inrush of water. Once the vacuum is released, the door swings back to its normal, closed position and the victim is trapped. Glands within the bladder secrete digestive enzymes and acids, and the same glands absorb the nutrients.

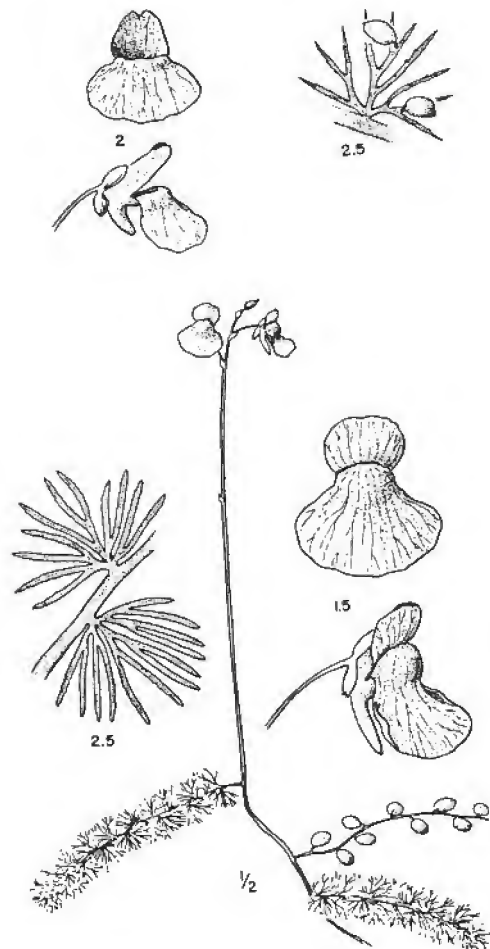


Utricularia trapping mechanism. The trap is set by removal of water from the bladder which results in lower pressure within the trap. A longitudinal section reveals the door is forced tightly against the opening. The trap is set-off when the trigger hairs on the door are touched. The door springs open and water rushes in, carrying with it prey in the vicinity. The door then closes entrapping the prey.

The activation of a trap results in some of the fastest movement ever recorded in plants. Literature generally reports that the sequence of events from tripping to re-closing occurs in about $1/50^{\text{th}}$ of a second. However, recent investigations suggest that the trapping process occurs at a much faster rate, perhaps as quickly as $1/500^{\text{th}}$ of a second. Unfortunately, the small size of the traps makes the adventure difficult to observe and, while this operation provides as dramatic a display as plants have to offer, few people have actually seen bladderworts in action.

Because of their unique capabilities, carnivorous plants are often collected and cultivated as novelties. Without special, individualized care by knowledgeable horticulturists, they usually die within a few months. With the exception of the common bladderwort, all of Wyoming's carnivorous plants are quite rare within the state, so removing them from their preferred sites cannot be justified. Besides, it may turn out that some of these are man eaters after all. It is best to leave them be.

Below: *Utricularia minor* flower and leaves (top) and *U. intermedia* (bottom) by Jeanne Janish (Flora of the Pacific Northwest 1973). Bottom left: *Utricularia* bladder trapping mechanism (from Pietropaolo 1986).



The Wyoming Native Plant Society, established in 1981, is a non-profit organization dedicated to encouraging the appreciation and conservation of the native flora and plant communities of Wyoming. The Society promotes education and research on native plants of the state through its newsletter, field trips, and annual student scholarship award. Membership is open to individuals, families, or organizations with an interest in Wyoming's flora. Members receive *Castilleja*, the Society's quarterly newsletter, and may take part in all of the Society's programs and projects, including the annual meeting/field trip held each summer. Dues are \$5 annually.

To join the Wyoming Native Plant Society, return the membership form below to:

Wyoming Native Plant Society
1604 Grand Ave.
Laramie, WY 82070

Wyoming Native Plant Society

Name:

Address:

- ☐ \$5.00 Regular Membership
- ☐ \$15.00 Scholarship Supporting Member
(\$10.00 goes to the annual scholarship fund)



Wyoming Native Plant Society
1604 Grand Ave.
Laramie, WY 82070



Ill. by Jane Dorn (Madrono 38:198-201, 1991)

Above: Desert yellowhead (*Yermo xanthocephalus*), arguably Wyoming's rarest plant species, has been proposed for listing as Threatened by the US Fish and Wildlife Service (see article on page 5). The Service is seeking public comments through 5 February 1999. Illustration by Jane Dorn.

Walter Fertig
507 Fetterman St
Laramie, WY 82070

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